CHAPTER 9
CIRCULATION DESIGN COMPONENT

9-1 Introduction

9-1.1 The image of the installation is greatly determined by the design and location of roadways, walkways, and parking lots. The primary roadway system and parking lots utilize considerable amounts of land, and are a visually dominant element of the installation (Fig 9.1). Roadways, walkways and parking lots are located as part of the site planning process. The circulation component is used to assess the circulation elements of the installation and identify specific characteristics that provide visual zone and theme identity.

Fig. 9.1 Circulation Component

9-1.2 The circulation system provides a primary vantage point to view the installation. Typically, the road network is historically predetermined, and may be functionally deficient and visually unattractive. Much can be done to improve the roadway network functionally and visually.

Fig. 9.2 Separate Incompatible Traffic

9-1.2.1 Functionally, a hierarchical network can be created that separates incompatible types of traffic. This separation of traffic promotes sustainability because it results in more efficient energy consumption.

9-1.2.2 Visually, the circulation hierarchy can be reinforced through design, planting, signage and lighting to promote a more attractive visual experience that promotes a sense of orientation and ease of circulation (Fig 9.2).

Fig. 9.3 Preserve the Environment, Provide Aesthetic Appeal

9-2 Circulation Objectives

9-2.1 The installation goal for the circulation system is to establish a

sustainable system that promotes aesthetic appeal, environmental preservation, and energy conservation while providing safe and efficient circulation (Fig. 9.3). The objectives below should be followed to achieve a sustainable circulation system:

9-2.1.1 Provide circulation that promotes and enhances public health and safety.

9-2.1.2 Provide a system of circulation that includes all forms of vehicular and pedestrian circulation (Fig. 9.4).

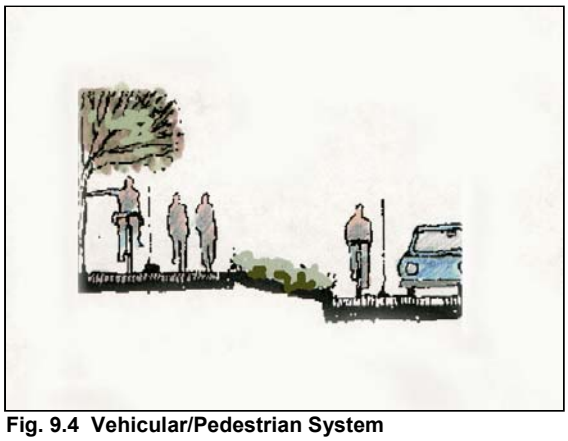


Fig. 9.4 Vehicular/Pedestrian System

9-2.1.3 Provide a system that includes hierarchies of vehicular and pedestrian traffic flow.

9-2.1.4 Adapt the circulation system to the natural conditions of the site.

9-2.1.5 Improve the existing circulation network for expansion, safety and appearance.

9-2.1.6 Promote maintenance and repair of existing and proposed circulation systems.

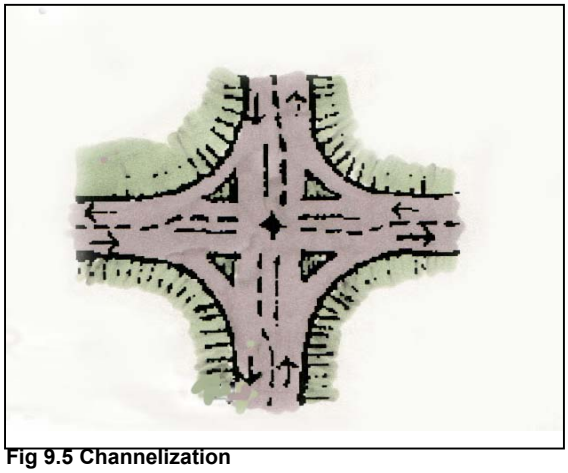


Fig 9.5 Channelization

9-3 Roadway Hierarchy

9-3.1 The roadway network of an installation should functionally and visually reflect a logical hierarchy of traffic circulation. The network should separate types of traffic by function, ranging from through traffic to local traffic. The visual character of each segment of the network should appropriately convey its role and function within the overall network. The basic network is classified as follows in terms of the type, character, and appearance of the road (Fig 9.5).

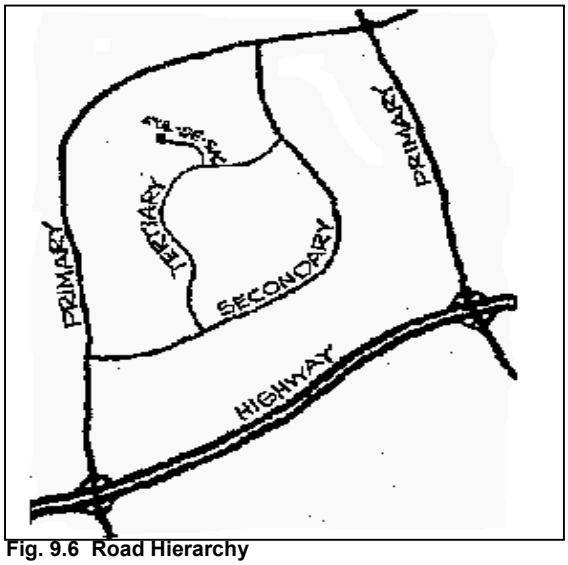


Fig. 9.6 Road Hierarchy

9-3.1.1 Highways – Highways provide primary high speed traffic access to, around, or through a military installation. The design characteristics include:

9-3.1.1.1 Continuous, relatively straight or large radii curvilinear alignments that carry high-speed through-traffic movement between major activity centers within a region.

9-3.1.1.2 A minimum of two (2) lanes in each direction typically divided by a median or median divider.

9-3.1.1.3 Alignments that border lane use areas rather than bisect them, and green space buffers between the road and adjacent uses.

9-3.1.1.4 Controlled access onto the road.

9-3.1.1.5 Either grade-separated or at grade channelized intersections with traffic signal controls (Fig.9.6)

9-3.1.1.6 Shoulders for emergency stopping but strict prohibition of on-street parking.

9-3.1.1.7 Street signing, lighting and planting that reflects the high-speed nature of traffic movement.

9-3.1.2 Primary Roads – These roads provide the network connecting major activity centers (Fig. 9.7). Design characteristics include:

9-3.1.2.1 Continuous, through-traffic alignments that are relatively straight or large-radii curvilinear to handle moderate-to-high speed traffic.

9-3.1.2.2 Alignments that form the boundary between different land use areas rather than bisect an area.

9-3.1.2.3 Two to three moving lanes in each direction typically divided by a median (Fig. 9.8).

9-3.1.2.4 Controlled access and a minimum of curb cuts limited to entranceways to major facilities or building groups.

9-3.1.2.5 At-grade intersections with traffic signal controls.

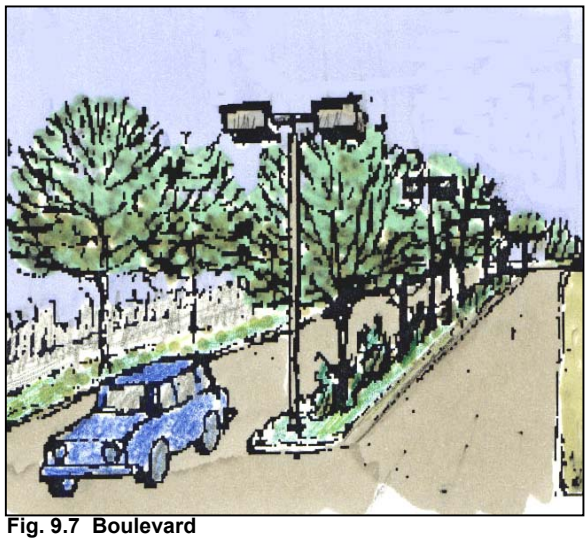


Fig. 9.7 Boulevard

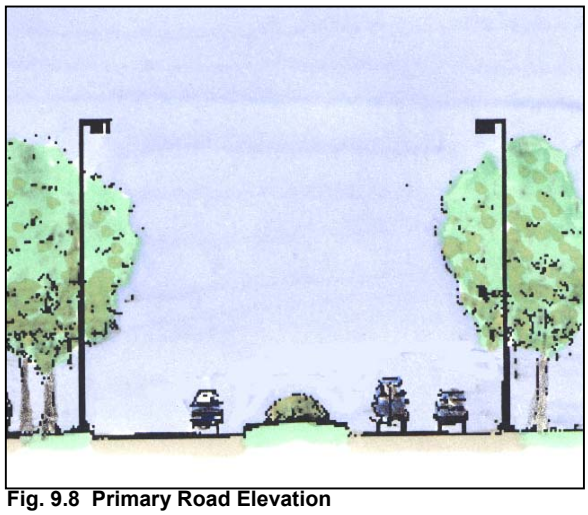


Fig. 9.8 Primary Road Elevation

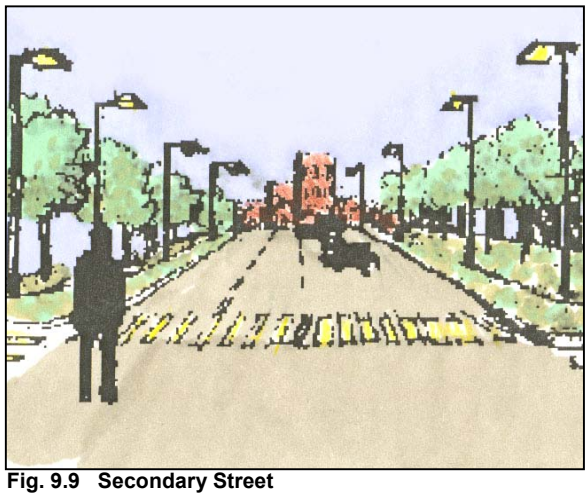


Fig. 9.9 Secondary Street

9-3.1.2.6 On-street parking prohibited.

9-3.1.2.7 Medians, street lighting, signing and planting that reinforces the moderate-to-high speed nature and importance of the road.

9-3.1.3 Secondary Roads – These roads provide the means of traffic movement between primary and tertiary roads Fig. 9.9). Design characteristics include:

9-3.1.3.1 Continuous through-traffic alignment between primary roads, either straight or curvilinear based upon the desired design speed topography and land pattern.

9-3.1.3.2 Direct access to abutting property.

9-3.1.3.3 A maximum of two moving traffic lanes in each direction, either undivided or a boulevard with planted median. (Fig 9.10)

9-3.1.3.4 On-street parking generally prohibited.

9-3.1.3.5 Sidewalks separated from the road by a planting strip.

9-3.1.3.6 Street lighting, signing and planting that reflects the moderate-to-slow speed nature of traffic and the character of the land use area they are within.

9-3.1.4 Tertiary Roads – These roads handle local traffic movement from secondary streets and provide direct access to abutting property (9/11). Characteristics are:

9-3.1.4.1 Alignments designed to discourage through-traffic.

9-3.1.4.2 Alignments are relatively short straight or curvilinear in keeping with topography, land use, and slow speed nature of traffic (Fig. 9.12).

9-3.1.4.3 Generally a maximum of two moving traffic lanes, one in each direction (Fig. 9.13).

9.10 Secondary Street Elevation

Fig. 9.11 Tertiary Street

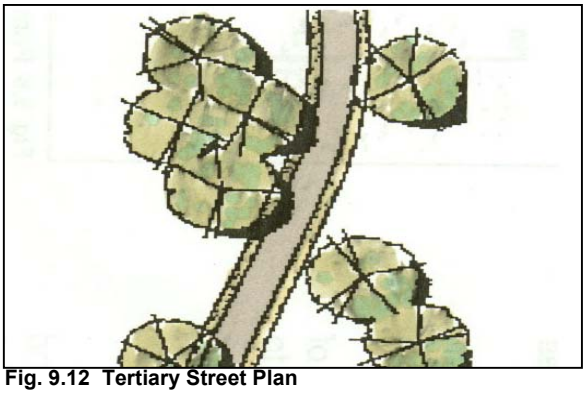


Fig. 9.12 Tertiary Street Plan

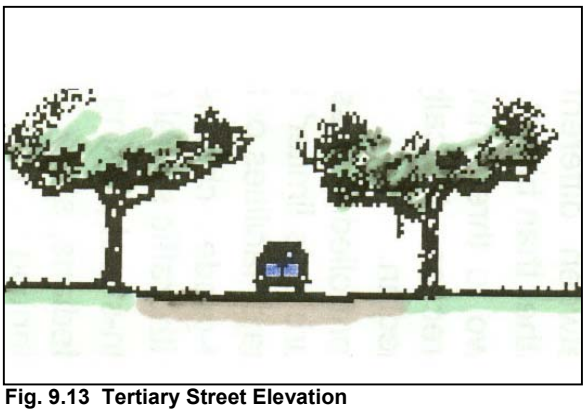


Fig. 9.13 Tertiary Street Elevation

9-3.1.4.4 On-street parking allowable on an infrequent overflow basis by the addition of a parallel parking lane or bay.

9-3.1.4.5 Curbs, gutters and sidewalks generally provided in residential areas with densities greater than two dwelling units per acre.

9-3.1.4.5 Sidewalks may be limited to only one side, depending upon need.

9-3.1.4.6 Street lighting, signing and planting in character with the slow speed nature of traffic and the land use area within which the road is located.

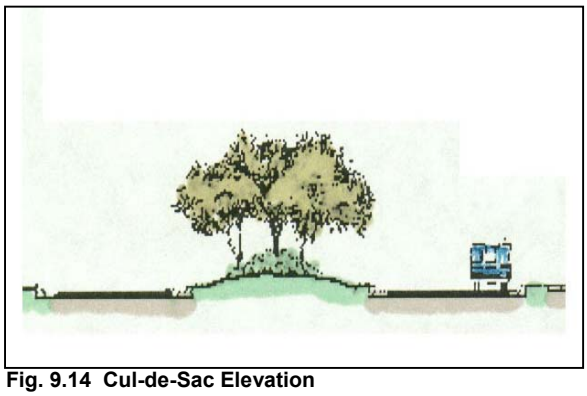


Fig. 9.14 Cul-de-Sac Elevation

9-3.1.5 Cul-de-sacs – Short dead-end tertiary streets, primarily in residential areas (Fig. 9.14). They connect at one end to a tertiary or secondary street and have a turnaround at the other end, providing direct access to abutting property while preventing through traffic. Design characteristics include:

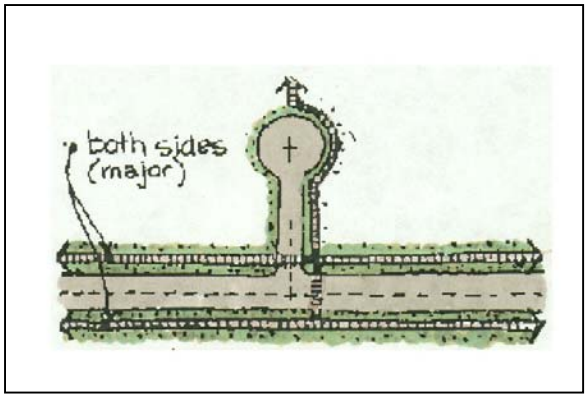


Fig. 9.15 Cul-de-Sac Plan

9-3.1.5.1 Short, straight or curvilinear alignments to serve abutting property (Fig. 9.15).

9-3.1.5.2 Generally a maximum of two traffic lanes, one in each direction.

9-3.1.5.3 Generally a maximum length of 600 feet, except or less except in areas where terrain and low density justify a longer length.

9-3.1.5.4 Turnarounds must include a diameter to accommodate fire and garbage trucks.

9-3.1.5.5 Turnarounds can be either symmetrical or offset.

9-3.1.5.6 Turnarounds should have center planting islands to reduce the expanse of paved area.

9-3.1.5.7 Overflow parking can be provided on street in parking bays or within center of turnarounds.

9-3.1.5.8 Sidewalks, if any, are generally limited to one side of the road.

Fig. 9.16 Rural Road

9-3.1.5.9 Street lighting, signing and planting in character with the slow speed nature of traffic and the land use area being served.

9-3.2.6 Other Roadways – The vehicular circulation system of an installation may also contain rural roads and patrol roads.

9-3.2.6.1 Rural Roads are for traffic through sparsely developed areas of the installation (Fig. 9.16).

9-3.2.6.2 Service Roads are for service traffic only to adjacent buildings.

9-3.2.6.3 Patrol Roads are special roads for surveillance and security purposes that carry restricted, low volume vehicular traffic.

9-4 Roadway System Design

9-4.1 The location and design of new circulation system alignments as well as improvements to the existing system should be prepared to promote development sustainability (Fig. 9.17). They should be designed to minimize impacts, relieve driver monotony, and provide a positive visual experience for the user (Fig. 9.18). The following design techniques should be applied to circulation system design:

9-4.2 Blend Circulation With Natural Landform. The horizontal and vertical alignment of roads, walkways and bikeways should minimize landform disturbance and blend with the natural setting (Fig. 9.19).

9-4.2.1 Minimize cut and fill by avoiding steep terrain and aligning roadway, walkway, or bicycle system to cross slopes diagonally or parallel to the contours rather than perpendicular to the contours.

9-4.2.2 Mold cut and fill slopes to blend into the natural landform (Fig 9.20).

Fig. 9.17 Positive Visual Experience

Fig. 9.18 Plan Circulation Systems to be Safe

Fig. 9.19 Blend Circulation Into Natural Landform

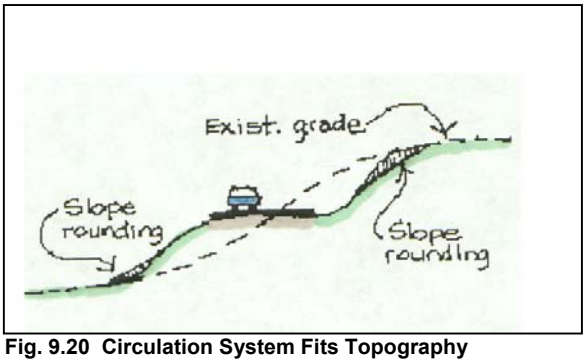


Fig. 9.20 Circulation System Fits Topography

9-4.2.3 Blend road drainage ditches, swales, or channels into the natural landform.

9-4.2.4 Use cluster development wherever possible to limit the lengths and required intersections of roadway and other circulation system elements and to preserve land.

9-4.2.5 Minimize pedestrian and bikeway crossings of highways, primary and secondary roads.

9-4.2.6 Use natural topographic conditions to create grade separated pedestrian and bikeway road crossings wherever possible especially on highways and primary roads.

9-4.3 Adapt Circulation to Preserve Vegetation. Design roads, walkways, and bike paths to minimize disturbance to existing vegetation, encourage revegetation in disturbed areas, and reduce the visual impact of landscape disturbance (Fig. 9.21).

9-4.3.1 Align roads through open areas rather than forested areas.

9-4.3.2 Minimize cut and fill to reduce the limits of clearing.

9-4.3.3 Clear only for sight distances rather than uniform right-of-way clearing.

9-4.3.4 Utilize tree wells or retaining walls to preserve specimen trees or significant vegetation areas.

9-4.3.5 Provide optimum conditions for revegetation by following proper planting and maintenance techniques.

9-4.3.6 Restore vegetation to disturbed areas using naturalistic plantings of native plant material.

9-4.4 Minimize Adverse Impacts on Adjacent Land Uses.

9-4.4.1 Air Pollution – Locate roadway alignments to minimize the impact of traffic-emitted pollutants on adjacent development (Fig. 9.22).

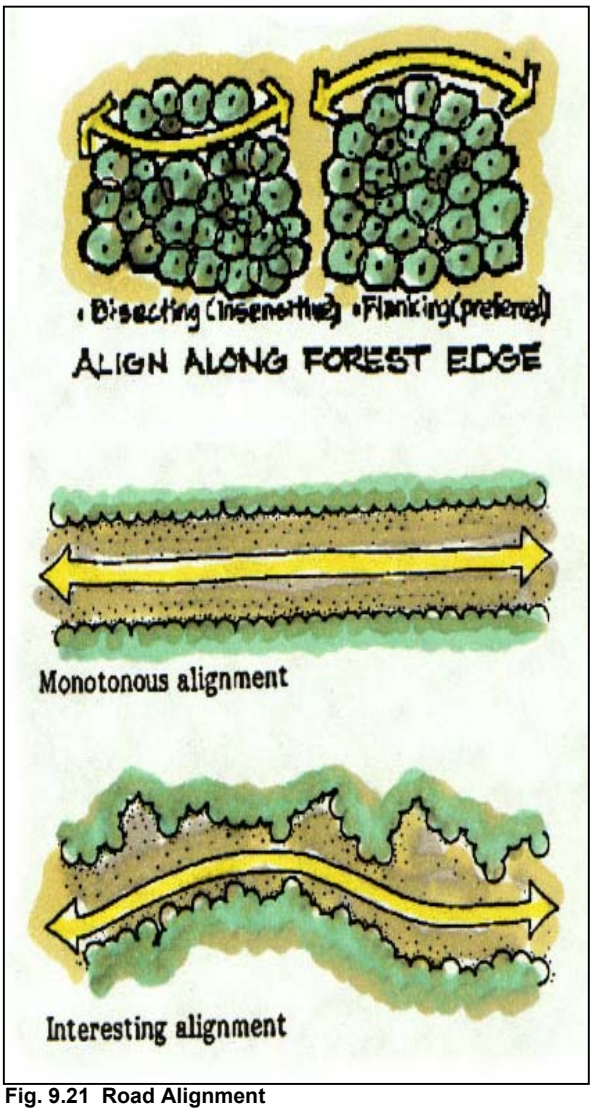


Fig. 9.21 Road Alignment


Fig. 9.22 Minimize Pollution Impacts

9-4.4.1.1 Locate roads adjacent to land uses that are minimally affected by traffic-emitted air pollutants.

9-4.4.1.2 Reduce the impact of traffic-emitted pollutants on more sensitive land use areas by providing planted buffers between them.

9-4.4.1.3 Locate roadways downwind from sensitive land use areas.

9-4.5 Noise Pollution – Design and locate roadways to reduce the impact of traffic noise on adjacent development.

9-4.5.1 Physically separate roadways from sensitive land uses including residential, medical, education, recreation, administration, religious, library, community or child care facilities.

9-4.5.2 Utilize noise abatement techniques such as berms, sound barrier walls and plant material to reduce noise levels (Fig 9.23).

9-4.5.3 Reroute truck traffic to roadways adjacent to less noise sensitive land uses.

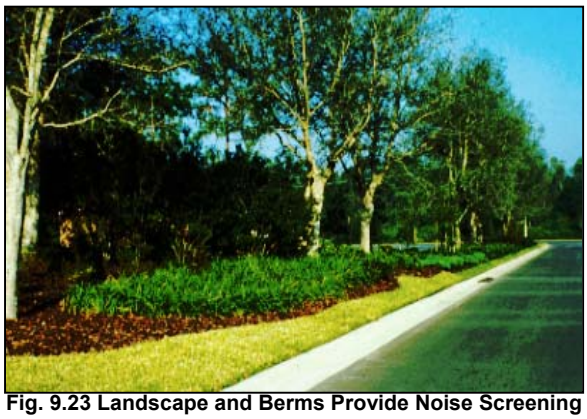


Fig. 9.23 Landscape and Berms Provide Noise Screening

Fig. 9.24 Intersection of Primary and Secondary Roads

9-5 Intersections

9-5.1 Intersections within the circulation system should be planned or improved to provide safe and efficient traffic flow for both pedestrian and vehicular traffic. The following design techniques should be used to plan or improve intersections:

9-5.1.1 Use T-intersections for tertiary road intersections with secondary or primary roads to reduce conflict and promote safety, particularly in residential areas (Fig 9.24).

9-5.1.2 Provide turning lanes at all intersections along tertiary roads to eliminate interference with through traffic flow.

9-5.1.3 Avoid dangerous, complex intersections of more than two streets intersecting at one point, streets intersecting at skewed angles, and jogged intersections.

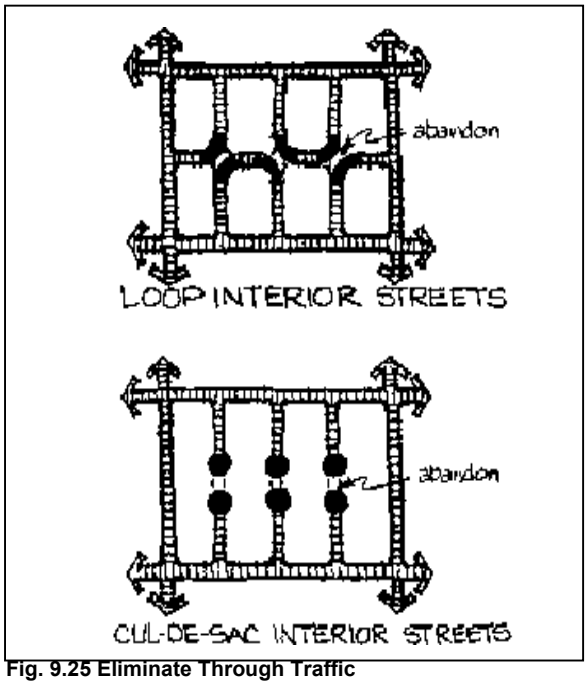


Fig. 9.25 Eliminate Through Traffic

9-5.1.4 Minimize intersections along highways and primary roads to reduce points of conflict and increase safety. Existing intersections with secondary and tertiary streets can be eliminated by the use of cul-de-sacs with traffic routed along parallel streets to primary and secondary streets (Fig. 9.25).

9-5.1.5 Eliminate intersections that are in close proximity to one another. They should be no closer than the minimum distance standard.

9-5.1.6 Create local service drives or access roads to parallel highways and primary roads to provide access to properties fronting the primary road avoiding a direct curb cut from the primary road to each individual property.

9-5.1.7 Include adequate sight distances to meet minimum standard requirements at all intersections.

9-5.1.8 Provide crosswalks at all intersections where necessary. The crosswalks should be marked with paint or vinyl strips or identified with a different paving surface.

9-5.1.9 Provide pedestrian access that is accessible to persons with disabilities in accordance with requirements of the ADAAG and the UFAS, with the most stringent standards applied in the event of conflicts.

Fig. 9.26 Curvilinear Road

Fig. 9.27 Design Streetscape to be Visually Pleasing

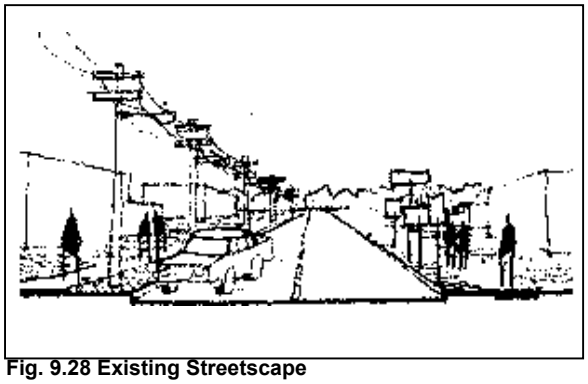


Fig. 9.28 Existing Streetscape

9-6 Streetscape

9-6.1 The visual appearance of the circulation system should be designed or enhanced to provide an aesthetically pleasing experience for the user. This can be achieved by the following design techniques:

9-6.1.1 Plant Material – The use of trees, shrubs, and groundcovers provides one of the simplest and most effective ways to improve the visual quality of the streetscape Fig 9.30). Planting should be utilized to

Fig. 9.29 Improved Streetscape

define the roadway hierarchy, screen and enhance views, reduce headlight and other glare, and soften the visual expanse of paving and buildings.

9-6.1.2 Lighting – Lighting along the circulation system should be utilized not only for public safety, but also for aesthetic appeal. Lighting intensity should be appropriate for the use. Light standards should be coordinated throughout the installation to provide a continuity of design elements.

9-6.1.3 Signage – The majority of the signage at a military installation is directed to the circulation system of roads, parking, walkways and bikeways. A sign system should be consistent throughout the installation to provide a continuity of design elements.

9-6.1.4 Utilities – Utilities are generally placed along circulation corridors. All utilities should be buried whenever possible. Where it is not possible, above ground utilities should be designed to not be visually offensive.

Fig. 9.30 Streetscape Softened with Plants

Fig. 9.31 Large Expanse of Parking Softened with Trees

9-7 Parking Requirements

9-7.1 The off-street parking requirements at military installations consume the greatest amount of area of all development that occurs on the installation. These areas are generally large expanses of pavement that create some of the most unslightly visual element on the installation (Fig. 9.31). Whether they are located in warm climes or cold climes, parking lots are built with little concern for the aesthetic or physical comfort of the user.

9-7.2 The total quantity of parking in any one location will vary with the needs of the facility.

9-7.2.1 All parking lots are to be accessible to persons with disabilities in

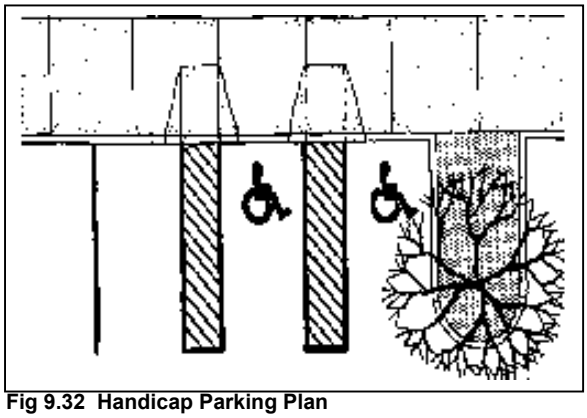


Fig 9.32 Handicap Parking Plan

accordance with requirements of the ADAAG and the UFAS, with the most stringent standards applied in the event of conflict (Figs. 9.32 and 9.33).

9-7.2.2 For initial planning and programming, allocate 400 square feet of parking lot area per car. The total provides adequate minimum space for the parking spaces, access drives and planting islands that make up a parking lot.

9-7.2.3 Minimize parking space requirements of a facility by selecting a site that will allow the sharing of parking with other related activities.

9-7.2.4 Small parking lots are usually preferable to larger lots because they enhance the visual environment by increasing the percentage of landscaped area to paved area and allow more conformance to natural topography.

9-7.2.5 The monotony of large parking areas can be altered by the use of designs such as curvilinear parking or the introduction of large planting islands (Fig. 9.31)

9-7.2.6 Promote means of access other than vehicular by providing alternative means of access such as walkways and bikeways (Fig 9.34).

Fig 9.33 Handicap Parking

Fig 9.34 Provide Pedestrian Walkways

9-8 Parking Lot Location and Design

9-8.1 Most parking lots are unattractive visually (Fig 9.35). Parking areas can be designed or enhanced to provide a more pleasing visual impact and a more comfortable physical experience for the user. The following design techniques should be used to create more aesthetically pleasing, comfortable parking lots:

9-8.1.1 Locate parking lots between and behind buildings to reduce the visual impact from the circulation system.

Fig. 9.35 Most Parking Lots Are Visual Liabilities

9-8.1.2 Locate parking lots on relatively level areas to avoid excessive cut and fill.

9-8.1.3 Avoid parking directly adjacent to buildings. Allow space for planting and sidewalks between parking areas and adjacent buildings (Fig. 9.36).

Fig. 9.36 Avoid Parking Directly Adjacent to Building

9-8.1.4 Design parking lots to be efficient in the design and placement of access drives and parking spaces. All drives providing direct access to parking spaces should provide spaces on both sides of the drive.

9-8.1.5 Provide planting areas at the ends of all rows of parking spaces. Provide islands with trees within the main parking lot to soften the visual expanse of the parking lot, provide shade and/or wind breaks (Fig. 9.37).

Fig. 9.37 Parking Relieved With Landscape

9-8.1.6 Use natural topography and existing trees to visually screen parking areas from adjacent facilities and other parking bays.

9-8.1.7 Design parking lots to preserve significant existing trees. Provide a planting area around the tree that is large enough to allow water to the root system. An area equal to the distance from the trunk to the outer drip line should provide an adequate planting area.

9-8.1.8 Parking structures, both below grade and above grade, have limited application at certain installations, particularly in densely developed areas where available land is scarce (Fig. 9.38). Parking structures are expensive but can provide a number of benefits including efficient land use, reduced visual impact and protection of vehicles from inclement weather. (Fig 9-38)

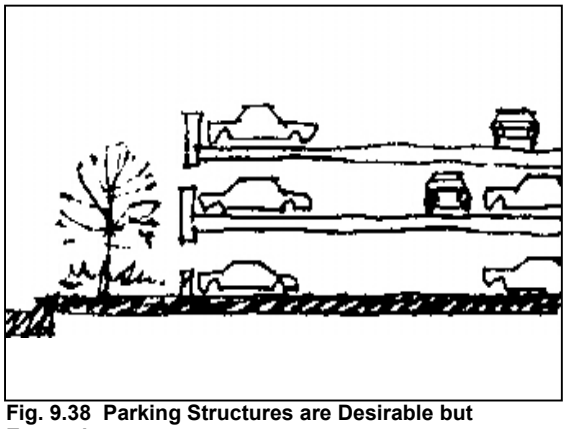


Fig. 9.38 Parking Structures are Desirable but Expensive

9-8.1.9 On-street parking is common on most military installations. All on street parking along primary and some secondary streets should be avoided because it reduces the vehicular carrying capacity of the street, is visually unattractive, and is unsafe. It is recommended that on-street

parking be allowed on tertiary streets and cul-de-sacs only.

9-9 Parking Lot Details

9-9.1 Paving – High use parking lots should be paved with concrete, asphalt, or other paving material. Gravel, cinder, or recycled rubber should be avoided. Grassed parking areas are suitable for overflow parking that will seldom occur. The use of open pavers that provide support for vehicle weight but allow grass to grow is recommended for emergency vehicle access.

9-9.2 Striping – Parking spaces, vehicle stop lines and pedestrian crosswalks should be striped in a color that contrasts with pavement color (Fig. 9.39). Double painted stripes between stalls are more effective in encouraging orderly parking.

9-9.3 Drainage – Design drainage as a function of parking lot size, slope, and drainage outfall location. Drainage to the naturally lower edge of the lot is preferable to drainage to the center.

9-9.4 Curbing – Continuous curbing should be used where possible to contain and direct drainage and to utilize as wheel stops.

9-9.5 Light Poles – Parking lot light fixtures should be located out of the way from traffic aisles and parking spaces. Ideally, they should be located in center or side islands protected by raised curbs. Poles and fixtures should be of a design style and scale that is compatible with the installation-wide lighting system while providing desired levels of illumination (9.40).

9-9.6 Screen Planting – Perimeter screen planting can effectively control the adverse visual impacts of parking lots, and provide

Fig. 9.39 Pedestrian and Parking Striping

Fig. 9.40 Coordinated Lighting Adds Interest

Fig. 9.41 Berms and Planting Screen Undesirable Views

windbreaks or shade as required by the installation locale Fig 9.41).

9-9.7 Earth Berms – Earth berms can effectively screen parking lots from view along major roadways (Fig 9.41). The berms should be designed and planted to blend with the contour of the earth in order to appear natural.

9-10 Service Areas

Buildings that require pickup and deliveries should have a service area that allows for easy access to a loading dock exclusively for service vehicles. These areas should be designed to provide direct, easy access for vehicles. They should be screened from public view to reduce negative visual impacts (Fig. 9.42).

9-11 Drop-Off Areas

Buildings that include a high percentage of persons arriving by vehicle should include a vehicle drop-off area. Buildings such as headquarters, child development centers, schools, dining facilities, and clubs should provide a convenient drop-off area for users and visitors (Fig. 9.43).

9-12 Pedestrian Walkways

9-12.1 Sidewalks provide connections for pedestrians between buildings and ancillary facilities such as parking lots and other areas. Well designed and located pedestrian walkways also provide a desirable alternative to the total dependence upon the vehicle. Typical sidewalk location and design at military installations show little consideration for the comfort of the user nor encourage the walking of longer distances that alleviates dependence on the vehicle (Fig. 9.44).

9-12.2 To encourage their use as an alternative means of circulation, pedestrian

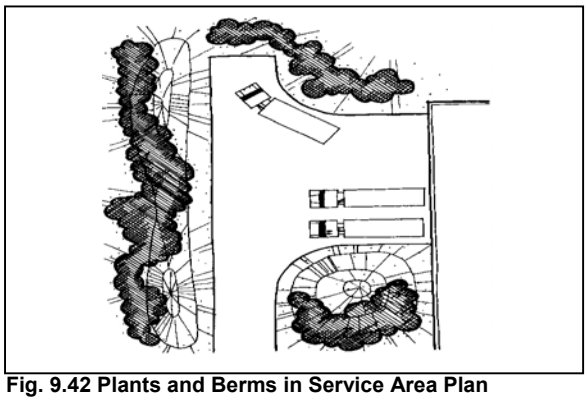


Fig. 9.42 Plants and Berms in Service Area Plan

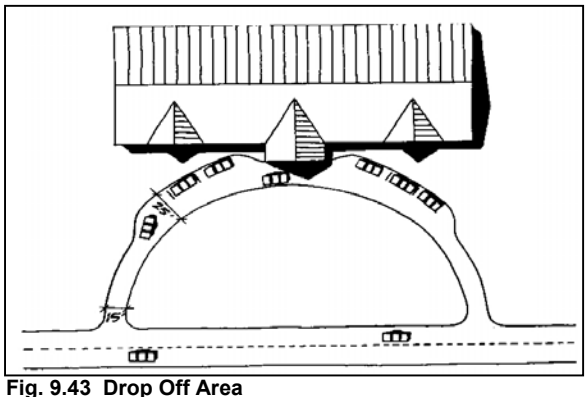


Fig. 9.43 Drop Off Area

Fig. 9.44 Sidewalk is Hazard to Pedestrians and Motorists

Fig. 9.45 Curvilinear Sidewalk Adds Interest and Safety

walkways should be designed and located to provide a comfortable, enjoyable experience for the user (Fig. 9.45). The use of walkways within the installation promotes development sustainability by conserving energy, reducing air pollution, and decreasing land requirements for parking.

9-12.3 In order to achieve this goal the following objectives must be met:

9-12.3.1 Moving vehicles are the primary hazard to pedestrians. Provide safe and secure pedestrian facilities that are separated from vehicular traffic. Other hazards are the threat of assault in dark, unobserved locations, and unseen obstacles along or in the path of travel.

9-12.3.2 Pedestrian walkways should be designed in response to demand for access among major activity centers and traffic generators.

9-12.3.3 Pedestrian walkways should be designed at a pedestrian scale to be comfortable and pleasant. (Fig 9.46)

9-12.3.4 All pedestrian walkways are to be accessible to persons with disabilities in accordance with requirements of the ADAAG and the UFAS, with the most stringent standards applied in the event of conflict.

9-13 Design of Pedestrian Walkways

9-13.1 Pedestrian walkways should be designed as a hierarchical network that provides different levels of use and convenience based upon the volume and purpose of pedestrian traffic. The walkway hierarchy is defined as follows:

9-13.1.1 Primary Walkway – Those segments of the system that carry the highest volumes of pedestrian traffic between major activity centers or traffic generators. These walkways are generally characterized by: hard surface paving; high

Fig. 9.46 Comfortable and Pleasant Walk

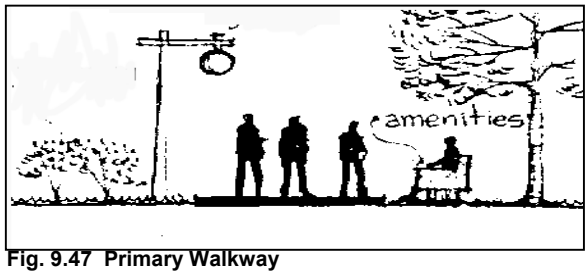


Fig. 9.47 Primary Walkway

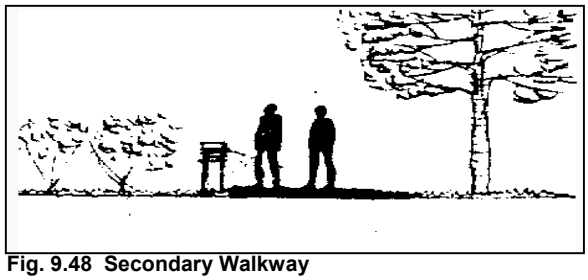


Fig. 9.48 Secondary Walkway

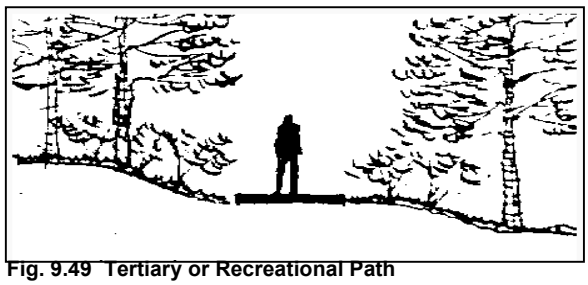


Fig. 9.49 Tertiary or Recreational Path

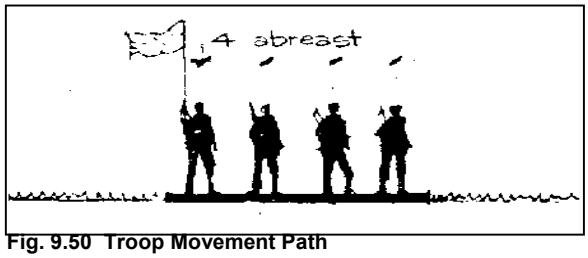


Fig. 9.50 Troop Movement Path

lighting levels; and a high level of pedestrian amenities such as benches, water fountains, and more refined landscaping (Fig. 4.47).

9-13.1.2 Secondary Walkway – Those segments that provide direct interconnections between activity centers and carry moderate volumes of pedestrians. They are characterized by hard surface paving and fewer amenities. The majority of the walkways within an installation fall into this category (Fig. 4.48).

9-13.1.3 Tertiary Walkways – This classification is for infrequently used walkways such as recreational paths. These tend to be less direct, but more scenic in character (Fig 4.49).

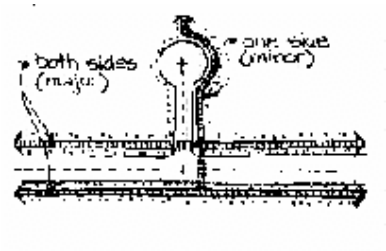
9-13.1.4 Troop Movement Paths – Installations with training facilities require special walkways for troops marching in formation between classrooms, barracks/dining hall facilities and parade grounds. These walkways should be hard surfaced and of adequate width to accommodate four (4) abreast (Fig. 4.50).

9-14 Location of Pedestrian Walkways

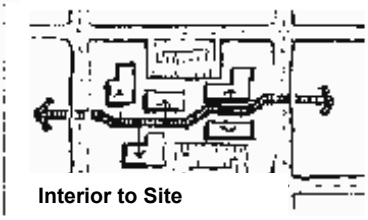
9-14.1 Pedestrian walkways are usually located within a street right-of-way abutting the street. This location is detrimental to the sidewalk user and to traffic along the street. Walkways should be located as follows (See Fig. 9.51):

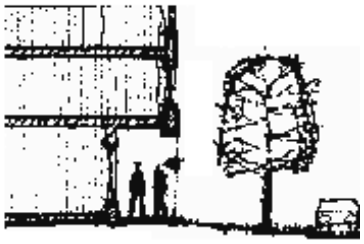
9-14.1.1 Parallel to Street – Walkway locations parallel to the street can be acceptable depending on the volume of traffic and adequacy of the street right-of-way width to include planted buffer strips to provide some separation between the roadway and the walkway.

9-14.1.2 Interior to the Site – Pedestrian walkways are best provided within the interior of a development site. This location provides separation from the roadway and



Walkway Hierarchy


Interior to Site


Arcades


Underpass

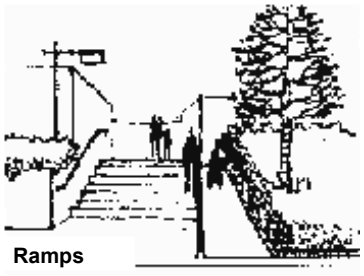

Ramps

Fig. 9.51 Location and Design of Sidewalks

promotes increased utilization of a single walkway by serving existing buildings on both sides.

9-14.1.3 Arcades – Pedestrian arcades along buildings encourage walkway use and comfort, especially in certain climates. Arcades provide cover from the elements that might otherwise prevent walking. Arcades should be incorporated into the design of major activity centers.

9-14.1.4 Grade Separated Walkways – Where possible, walkways that cross highways or primary roads should be grade separated from the vehicular lanes.

9-15 Bicycle Paths

9-15.1 The use of bicycles as alternatives to the automobile has become more acceptable to installation personnel. This trend is encouraged as a method of reducing the automobile vehicle trips within an installation and reducing the need for greater traffic carrying capacity. Also, cycling is a popular recreational activity that is enhanced by the availability of a safe, well planned system of bike trails. The use of the bicycle promotes development sustainability by conserving energy, reducing air pollution, and by decreasing land requirements for parking.

9-15.2 A system of bikeways should be designed as a component of the installation circulation system. A bikeway system should provide direct routes between primary traffic origins and destinations within an installation. This network should be continuous and should minimize conflicts between bikes, pedestrians, and vehicles. Bike systems should include attractive, well located parking areas that provide adequate parking for the bicyclist.

9-15.3 Bikeways are to be designed according to the following classifications (Figs 9.52 and 9.53):

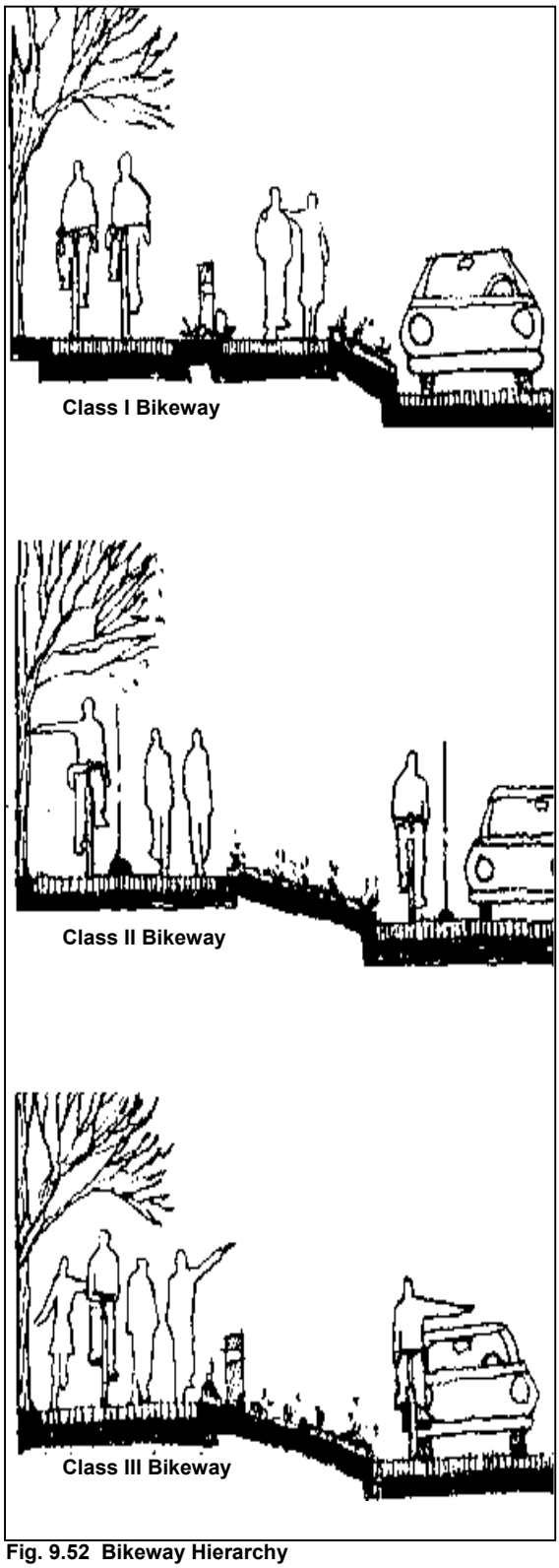


Fig. 9.52 Bikeway Hierarchy

9-15.3.1 Class I Bikeway – A bikeway within a completely separated right-of-way designed for the exclusive use of bicycles. Pedestrians and motorists should be discouraged from crossing this bikeway.

9-15.3.2 Class II Bikeway – A right-of-way for the semi-exclusive use of bicycles. There should be a continuous or intermittent curb to provide partial separation between the bicycles and circulation modes.

9-15.3.3 Class III Bikeway – This is a right-of-way shared with either moving vehicles or pedestrians. The bicycle lane or lanes are identified with painted lines and signage.

Fig. 9.53 Class III Bikeway

9-16 Circulation Assets and Liabilities

Upon completion of the survey of the visual impacts of the circulation components of each visual zone, a list of assets and liabilities in each zone will be prepared (Fig. 9.54). This list can then be used to prepare a list of recommended projects to enhance the visual assets of the circulation system and overcome the visual liabilities.

Fig. 9.54 Safe, Visually Attractive Circulation is an Asset